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Title: **Open Wireless Architecture for Fourth Generation Mobile Communications**
Application No. **10/709,485**
Notice Date: August 25, 2006

Date: October 18, 2006

Dear Mr. Fox and Mr. Appiah:

Thanks very much for your letter regarding our patent dated on August 25, 2006.

After very careful reviewing of your comments, we have provided the following responses on this matter:

We have studied in details all your referenced patents as listed in the "Notice of References Cited". Before we analyze our patent application, we need to point out that these three referenced patents are completely different from our patent, and further more, they focus on separate unrelated issues which we conclude as follows:

[Reference A: US-2003/0220074 A1 by Wee, et al.]

The key points of this patent include:

1. The system is focused on configurable wireless repeater system only.
2. The portable wireless system is mainly a standard-specific individual cellular communication terminal only.

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3. The architecture is a closed architecture, not an open architecture, meaning that, the system can only reconfigure and reprogram the units within the pre-set standards options.
4. The architecture does not define the open interface in order that the system can be fully open for any standards.
5. The system is only focusing on wireless repeater relaying third party short-range wireless communication systems with specific standards-oriented rather than open air interfaces oriented.
6. It is a well common sense for a person with ordinary arts in the field that reconfigurable systems are systems whose preset hardware configuration and software can be changed under software control. Open Wireless Architecture (OWA) defines the open interfaces in wireless networks and systems so that users can buy different parts from various vendors. OWA system is upgradeable and extensible, and the system can support various standards through open interfaces' parameters.
7. Re-configurability and re-programmability are just a closed architecture limited by the system configuration and preset hardware resources.
8. The repeater system relaying the third party wireless communication system is a closed architecture design because it only supports re-configurability or re-programmability within preset closed system resources and functionalities.
9. The portable wireless system is just coupling the traditional cellular system with the short-range wireless communication systems together, and wirelessly relaying the third party wireless communications. This kind of coupling technique is of closed architecture and has been used for conventional multi-mode wireless systems, for example, GSM/Bluetooth dual mode system.
10. The system is to allocate unused wireless channels of the cellular communication system available to other devices of third party wireless systems, but the resource allocation remains conventional static allocation, rather than dynamic resource allocation utilized in the Open Wireless Architecture (OWA) system.
11. This closed multi-mode wireless repeater system was already proposed in late 90s by many wireless vendors including Infineon, Ericsson and Qualcomm, etc. It consumes much power for wireless terminal device because the users can not plug out the unused short-range wireless modules when the terminal is in regular cellular communication operations. This system architecture is very closed and not designed for future mobile communications.
12. This system brings many problems to the cellular wireless terminal systems, especially the wireless transmission security, information security, wireless billing problem, user service management and system resource management. Information security and channel management are the most critical issues in this system.
13. The system is still limited to conventional static spectrum utilization.
14. It is not a good business model to relay the cheap short-range wireless communication services through the expensive cellular wireless communication channels (mobile cellular communication spectrum is very expensive and the spectrum efficiency is quite low). In addition, the service model and the mode switching are challenges too.
15. This system does not work for future mobile communications because the future mobile systems will be based on dynamic resource management (including channel management) and dynamic spectrum allocation. In addition, in terms of whole

wireless network capacity, an individual improvement on wireless channel utilization does not reflect whole wireless network capacity and performance improvement. For example, in CDMA networks, if individual unused channels are all utilized, the whole network performance and capacity will be seriously decreased.

16. This system requires lots of processing on the service provider's side, such as service model, authentication, billing model, mode selection, transmission management and cellular user information security, etc.

As conclusion, this wireless repeater system is totally different from our OWA (Open Wireless Architecture) system.

[Reference B: US-7,058,415 B2 by Bushnell, et al]

The key points of this patent include:

1. This dual model handset is just coupling cellular and cordless systems together which is of closed architecture.
2. The cellular and cordless systems are standard-specific systems rather than an open architecture system.
3. The system does not define the open interfaces in order that the system can be fully open for any standards. The system is not extensible and upgradeable as defined in Open Wireless Architecture (OWA) system.
4. The system is network infrastructure specific system which requires wireline network operator and wireless network operator working together to support this cellular/cordless integrated service platform. In contrast, OWA terminal system can be an infrastructure independent wireless communication system.
5. The system is basically a wireline based communication system with cellular forwarding functioned capability.
6. The system still requires two separate communication directory numbers, but the cellular number is shadowed for incoming cellular call only.
7. The system is constructed upon the conventional closed architecture infrastructure including traditional mobile switching center (MSC) and traditional public telephone switching system (PTS). In contrast, OWA infrastructure replaces traditional MSC and Base-Station with open wireless router functionalities.
8. The system is based on traditional circuit-switched infrastructure rather than future-proven IP packet networks.
9. The similar system was already developed by Alcatel France before 2002.
10. MSC and PTS must work together, in the traditional circuit switch mode, to forward the incoming calls if the terminal is not in the cordless wireless coverage.
11. The handset system consumes much power because all modules are not extensible, upgradeable and removable as otherwise defined in the OWA systems.

Therefore, this dual mode cellular/cordless terminal is completely different from our OWA terminal system for the future mobile communications.

[Reference C: US-2002/0187813 A1 by Guo, et al]

The key points of this patent include:

1. This is only for cellular base station design, not optimized for wireless terminal design.
2. It is a common sense solution introduced many years ago. For example, it was proposed in ITU TD-SCDMA standards since 1996, and developed in many companies including Arraycomm and Adaptive Antenna, etc.
3. It is basically on feedback calibration techniques of smart antennas.
4. The feedback information is used for optimizing beamforming and antenna calibration.
5. It is designed for standard-specific wireless systems because the utilized common control channel can be different in various wireless transmission technologies.
6. It did not address any open RF (radio frequency) module issues for the smart antenna array applications in the future mobile communications.

Hence, this smart antenna array system is out of the patent application scope of our OWA systems as a whole.

After we understand well these referenced patents, let's explore the main patentable values of our patent:

- Open Wireless Architecture (OWA) means each system module is an open module rather than any standard-specific closed module.
- Repeater is a closed architecture because its system modules are standard-specific modules coupled together.
- Open modules are extensible and upgradeable, and further reconfigurable and reprogrammable as well.
- Standard-specific modules can be reconfigurable and/or reprogrammable (for example, GSM/Bluetoth reconfigurable dual module), but not extensible and upgradeable in principle.
- Simply coupling of multi-standards systems is a closed architecture rather than an open system platform defined in the OWA technology.
- OWA open modules are based on Open Interface Parameters of each open module, including independent open module and dependent open module. Independent open modules can be plugged-out freely whenever in Turn-off mode or removable upon request through open interface parameters of the OWA terminal system.
- OWA terminal is a fully open-module communication device. When the terminal is not used for wireless communication (for example, the terminal can connect to the wireline network through its USB network interface or just become a standalone handheld computer), most of open wireless modules, including open RF (radio frequency) modules and open base-band modules can be turned off and plugged-out from the terminal device. Then, this OWA terminal is simply a general-purpose handheld computer or a wireline terminal device.

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- OWA supports dynamic spectrum sharing and dynamic resource allocation as each system modules are extensible, upgradeable and plug-in/plug-out, similar to computer system of open computer architecture (OCA).
- OWA is designed for fourth generation mobile communications which converge broadband wireless access systems and wireless mobile (cellular) networks into one open communication platform.
- OWA systems will be explored beyond traditional telecommunication applications, such as automobile industry, airline industry, defense industry as well as other ICT (information and communication technology) industries.
- OWA is an independent open system model, supporting both wireless terminal system and wireless infrastructure systems, similar to the open computer architecture (OCA) for personal computer (PC) and laptop.

The wireless industry is rapidly transitioning from proprietary architecture to more flexible, cost effective open architecture systems. This transition is creating interesting challenges for developers, manufacturers, integrators, operators and end-users as they wrestle with complexities of open wireless architecture systems. Open wireless architecture (OWA) system defines the open interfaces in wireless networks and systems, including open base-band signal processing units, open RF units, open networking units, and open OS and application units, so that the OWA system can support different industrial standards and integrate the various wireless networks into an open broadband platform. For comparison, the conventional Software Defined Radio (SDR) is only a radio in which the preset operating parameters and transmission standards including *inter alia* frequency range, modulation type, and/or output power limitations can be re-set or altered by software. Therefore, SDR is just one of the implemental standard-specific modules of the open wireless system.

Now, let's go ahead to discuss on your comments one by one.

[Claim Rejections – 35 USC § 112]

Following your comments, I have corrected and amended the claims 1-14 as enclosed. Based on the requirements of 37 CFR 1.121 (c), the amendment to the claims has been carefully prepared in the proper form.

[Claim Rejections – 35 USC § 103]

As stated in the above section, our invention is totally different from your references cited (Wee, Bushnell and Guo). Let's analyze it one by one in details:

In response to your comment on Claim 1, our argument is:

1. As I stated above, Bushnell's Cellular/Cordless dual mode phone is a closed coupling architecture which is totally different from our OWA (open wireless architecture) systems.

2. Bushnell actually utilized two different numbers for wireline phone and wireless phone. But the wireless number is shadowed and its HLR/MIN is mapped for call forwarding purpose.
3. Bushnell's dual mode solution is basically a call-forwarding mechanism between wireline and wireless networks, and limited to two standards only.
4. Bushnell's systems require mobile cellular operators and wireline operators to work together on incoming call forwarding supported by MSC (mobile switching center) and public telephone switch.
5. Bushnell's architecture is a very closed architecture including wireless terminal and wireless infrastructure (base station and the MSC), and all system modules are standards-specific and limited to preset wireless standards only.
6. Bushnell's solution is limited to traditional circuit-switch networks only because the call forwarding relies on traditional POTS circuit and traditional cellular circuit operations.
7. Bushnell's solution is limited to traditional and conventional circuit-switch communication networks.
8. Wee's system is also limited to wireless repeater system of closed architecture.
9. Wee is only limited to relaying third-party short-range wireless communications.
10. Wee's cellular channel management is still static though some unused channels can be reassigned for third-party wireless systems.
11. OWA system is based on open interface parameters mapped from various air interfaces, like open computer architecture, each system module is extensible, upgradeable and removable, and therefore, the OWA platform is truly open for any wireless standards and optimized for future mobile communications.
12. OWA system is open for any wireless air interface based on one single user number because OWA platform is open to support both IP packet network and traditional circuit-switched network. Same as Router solution with open network architecture by Cisco Systems, OWA's unified personal communication identifier can be dialed in the form of traditional telephone number or in the IP address.
13. OWA's infrastructure is also open defined throughout the wireless networks. The traditional base station is replaced by the OWA wireless router so that different "base stations" can connect each other, either wirelessly or wirelinely, by OWA IP networks.
14. OWA system is designed for fourth generation mobile communications targeting year 2010 and beyond.
15. OWA system supports dynamic spectrum access and sharing as well as dynamic resource management because each system module is an open module and many of them are independent open modules which are extensible, upgradeable and removable.

I conclude that these prior arts fail to teach anything disclosed in the application of our present invention, and hence they are unrelated and completely different from our application.

In response to your comment on Claim 2, our argument is:

1. Same as above, Bushnell' system is a close architecture supporting cellular/cordless two wireless standards only.

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2. Bushnell's system supports traditional circuit-switch infrastructure only.
3. Bushnell's system modules are standard-specific modules instead of open modules.
4. Bushnell's cordless base station is a traditional closed and circuit-switch access station for cordless phone.
5. Bushnell's processing module is not an open module as it is not extensible, upgradeable and removable.
6. Bushnell's RF modules are limited to one cellular and one cordless module only coupling together which is very close architecture.
7. Bushell never defined any open interface or open BIOS for the dual mode phone.
8. Wee's PC card or PCMCIA card is a user application card only instead of an open wireless interface modules defined in the OWA system.
9. Wee's system is a complete closed repeater system rather than a future-proven open wireless architecture system for the future mobile communications.
10. OWA system is constructed upon the open wireless BIOS interface structure supporting fully open modules throughout the OWA system.
11. OWA's software definable module (SDM) is an open system module with open interface parameters defined in the OWA system for the future mobile communications.

In conclusion, these prior arts fail to teach anything disclosed in the application of our present invention, and hence they are unrelated and completely different from our application.

In response to your comment on Claim 3, our argument is:

1. Bushnell's dual mode phone never supports dynamic spectrum management because Bushnell never releases the unused spectrum whenever the air interface is not used.
2. Bushnell's system is a closed architecture, and is impossible to support such dynamic spectrum allocation.
3. Bushnell' solution only switch between cellular mode and cordless mode subject to specific service coverage. But either way it never releases the system resource to others.
4. Bushnell's system consumes much more system resource and performance on incoming calls forwarding if the user is not in the cordless coverage.
5. Bushnell's system is limited to traditional circuit-switch networks which are very inefficient in terms of resource management and spectrum management.
6. Bushnell's dual model phone is simply coupling cellular and cordless into one terminal which is an closed architecture and all the system resource management remains static and fixed.
7. Full service convergence and transmission convergence require the system to be open architecture, such as open computer architecture in PC (personal computer) and open network architecture in Router. Bushnell never defined such open architecture, and Bushnell's system is just switched between one cellular and one cordless mode only.
8. Bushnell's system is only limited to preset cellular and cordless systems without being open to any convergence layer of various wireless standards.
9. Bushnell's forwarding solution does not work for future converged wireless/wireline communications due to its poor performance and resource consumption.

10. Bushnell's system re-configuration is limited to switching between one cellular and one cordless mode only which is a closed architecture.
11. OWA system is based on open interface parameters defined through open wireless BIOS. So, whenever the air interfaces change, the system remains unchanged except the open interface parameters updated. In this way, the service convergence and transmission convergence are fully implemented and system re-configuration becomes very easy. Same as open computer architecture is PC, user can change any software and hardware modules without any change in the open system platform because each module is defined as open module which is extensible, upgradeable and removable.

I conclude that these prior arts fail to teach anything disclosed in the application of our present invention, and hence they are unrelated and completely different from our application.

In response to your comment on Claim 4, our argument is:

1. Both Bushnell and Wee never define such open wireless BIOS defined by the OWA system.
2. Both Bushnell and Wee's systems are close architecture, and impossible for open system modules.
3. The future radio is first a computer (with open computer architecture), then an open wireless architecture (OWA) system so that each module is an open module which is extensible, upgradeable and removable.
4. Same as BIOS defined in open computer architecture, OWA defines the open wireless BIOS to make the wireless architecture open.

I conclude that these prior arts fail to teach anything disclosed in the application of our present invention, and hence they are unrelated and completely different from our application.

In response to your comment on Claim 5, our argument is:

1. Bushnell's system is not an open system, and Bushnell never defined the open processing systems for base band processing.
2. Wee never defined such open base band processing systems in its wireless repeater system.
3. Both Bushnell and Wee limit their air interfaces to the preset cellular and short-range wireless standards which is totally a closed architecture.
4. OWA system defines each base band processing module to be extensible, upgradeable and removable open module based on open interface parameters.
5. Open modules are re-configurable and re-programmable. But re-configurable or re-programmable modules may not be open modules, for example, standards-specific modules are not open modules, but can be re-configurable.

I conclude that these prior arts fail to teach anything disclosed in the application of our present invention, and hence they are unrelated and completely different from our application.

In response to your comment on Claim 6, our argument is:

1. Both Bushnell and Wee's systems are based on traditional circuit-switched networks, and impossible to configured to be a wireless router.
2. Wireless Router required open network architecture and open wireless architecture so that system can route freely based on IP packet network.
3. Bushnell's system is constructed upon traditional circuit switch POTS circuit and traditional cellular circuit network for call forwarding and operations.
4. Wee's system is constructed upon traditional cellular telephone network and third party short range wireless systems without defining any IP packet networks.
5. The name "Repeater" is only used for traditional circuit switched networks because in IP packet network, all traditional separate equipments, such as repeater, switch, base station, network station, etc are all converged into one function platform "Router".
6. OWA system defines four main open units including base band unit, RF unit, network unit and application/service/OS unit. The open network unit is in converging the future wireless networking capability including All-IP wireless infrastructure.

I conclude that these prior arts fail to teach anything disclosed in the application of our present invention, and hence they are unrelated and completely different from our application.

In response to your comment on Claim 7, our argument is:

1. Wee never defined such open base station architecture to the backbone network.
2. Wee's repeater system is an closed architecture only relaying the third party short range wireless communications.
3. Wee's repeater system is basically a wireless terminal system supporting utilization of unused channel resources including time slots in TDMA or codes in CDMA, etc.
4. Wee's repeater system is not a broadband wireless access system because the cellular channel is a narrow band wireless channel and the cellular spectrum utilization is inefficient compared with wireless access systems (without mobile handover).
5. Wee's third party wireless system is in the short range wireless domain, and mostly working in unlicensed bands, such as bluetooth and Wireless LAN, which is very much limited in terms of transmission datarate and local coverage.
6. Wee's repeater is far from the backbone network because its backbone network sits behind its MSC. In other words, Wee's repeater must first connects to its base station, and then the base station must forward to its local MSC. Wee's repeater can not connect to its MSC directly.
7. Wee's repeater is a totally circuit switched system.
8. OWA's base station is already an open wireless router which can be located in any node of the IP packet network infrastructure. The link between routers and backbone networks can be wireless or wireline. Normally, for maximum spectrum utilization, the broadband wireless access system is employed to link the wireless router to the backbone networks in military applications.

I conclude that these prior arts fail to teach anything disclosed in the application of our present invention, and hence they are unrelated and completely different from our application.

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In response to your comment on Claim 8, our argument is:

1. Both Bushenll and Wee's systems are closed architecture limited to preset wireless standards.
2. Both Bushnell and Wee never defined the open architecture system supporting various wireless air interfaces.
3. Re-configuration may not be open architecture, especially for standard-specific wireless systems.
4. Both Bushnell and Wee's systems are just coupling cellular and short-range wireless systems into one terminal which is a totally closed architecture.
5. OWA system defines the open interface parameters so that various wireless air interfaces can be mapped into OWA modules which are extensible and upgradeable.

I conclude that these prior arts fail to teach anything disclosed in the application of our present invention, and hence they are unrelated and completely different from our application.

In response to your comment on Claim 9, our argument is:

1. Both Bushnell and Wee never defined a clear way to detect the different air interfaces.
2. Both Bushnell and Wee's systems are closed systems, so the detecting is limited to the preset wireless standards.
3. Bushnell's system is switchable between two modes: cellular and cordless system, so the detection is very limited.
4. Wee's repeater system is basically relaying the transmission for third party short range wireless systems, so the detection is also limited to the switchable short-range wireless standards.
5. OWA system defines each system module to be open module including RF module and baseband processing module. Therefore, detection can be executed in parallel in different open modules subject to system resource availability.

I conclude that these prior arts fail to teach anything disclosed in the application of our present invention, and hence they are unrelated and completely different from our application.

In response to your comment on Claim 10, our argument is:

1. Both Bushnell and Wee never defined an open software system for the wireless communications.
2. Both Bushnell and Wee's systems are closed architecture and limited to the switched cellular and short-range wireless systems only.
3. Re-programmability is not automatically an open architecture system.
4. OWA system defines all system modules both hardware modules and software modules to be open module. Furthermore, most high-layer modules (application, service and OS modules) are independent open modules which are extensible, upgradeable and removable.

I conclude that these prior arts fail to teach anything disclosed in the application of our present invention, and hence they are unrelated and completely different from our application.

In response to your comment on Claim 11, our argument is:

1. Both Bushnell and Wee never defined such open wireless BIOS which is the core platform of the OWA system.
2. Both Bushnell and Wee's systems are closed architecture and limited to the switched cellular and short-range wireless systems only.
3. OWA system, same as open computer architecture in computer system, defines its open BIOS platform so that each system module becomes an open module based on the open interface parameters.

I conclude that these prior arts fail to teach anything disclosed in the application of our present invention, and hence they are unrelated and completely different from our application.

In response to your comment on Claim 12, our argument is:

1. Both Bushnell and Wee never addressed this issue.
2. Guo's solution is only for cellular base station design, not optimized for wireless terminal design.
3. Guo's solution is basically on feedback calibration techniques of smart antennas.
4. In Guo's solution, the feedback information is used for optimizing beamforming and antenna calibration.
5. Guo's solution is designed for standard-specific wireless systems because the utilized common control channel can be different in various wireless transmission technologies.
6. Guo did not address any open RF (radio frequency) module issues for the smart antenna array applications in the future mobile communications.
7. Guo did not address any spatial multiplexing algorithms for future mobile communications.
8. Guo did not address any diversity algorithm to combat fading in order to work at less SNR.
9. OWA system supports open system modules including open RF modules and open base band processing modules so that the processing modules can be in parallel subject to system resource availability. For example for the fourth generation mobile communications, MIMO modules can be in the base station (or wireless router) while DBF (digital beam forming) module in the wireless terminal.

I conclude that these prior arts fail to teach anything disclosed in the application of our present invention, and hence they are unrelated and completely different from our application.

In response to your comment on Claim 13, our argument is:

1. Wee's PC card or PCMCIA card is just an application specific module rather than an open baseband processing module and air interface module defined in the OWA system.
2. Wee's system is a closed architecture and limited to the preset cellular and third party short range wireless systems only.
3. Wee never defined such external system module both in software and hardware.
4. Wee's system is limited to wireless repeater system supporting short range third party wireless communications only.
5. OWA system defines each system module, both internal and external modules, to be open module.

I conclude that these prior arts fail to teach anything disclosed in the application of our present invention, and hence they are unrelated and completely different from our application.

In response to your comment on Claim 14, our argument is:

1. Both Bushnell and Wee never addressed the open convergence solutions.
2. Bushnell only addressed the switching between cellular and cordless system which is a closed architecture.
3. Open service-oriented platform requires underlying open network architecture and open wireless architecture that both Bushnell and Wee never addressed.
4. Bushnell's dual mode system is just a coupling of cellular and cordless systems, and is not an open convergence solution.
5. Bushnell's system is limited to traditional circuit switch networks including traditional POTS circuits and traditional cellular telephone networks with MIN/HLR in the traditional MSC.
6. OWA system supports both high layer open convergence and low layer open convergence where each convergence module is extensible, upgradeable and removable.
7. These OWA convergence layer modules are defined through underlying open wireless BIOS definition to construct the whole OWA system for the future mobile communications.
8. OWA system supports both IP packet networks as well as traditional circuit switch networks.

I conclude that these prior arts fail to teach anything disclosed in the application of our present invention, and hence they are unrelated and completely different from our application.

I hope you satisfy with my responses and allow these claims (1-14) accordingly.

Again, I strongly do not believe that one ordinary skill in the art can have the ability to modify the referenced patents to come out our disclosed invention.

Thank you for your time in this matter.

We hope you find this reply useful, valuable and satisfactory.

If anything else is needed, please feel free to contact me by e-mail, etc.
Thanks again for your time and favorable consideration in advance.

Yours truly,

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